CLAIMS

What is claimed is:

1. A low dielectric constant material, comprising:

a first backbone having a first aromatic moiety and a first reactive group;

a second backbone having a second aromatic moiety and a second reactive group, wherein the first and second backbones are crosslinked via the first and second reactive groups in a crosslinking reaction; and

a cage structure covalently bound to at least one of the first and second backbones, wherein the cage structure comprises at least 10 atoms.

2. The low dielectric constant material of claim 1 wherein the crosslinking reaction takes place without an exogenous crosslinker.

3. The low dielectric constant material of claim 2 wherein the aromatic moiety comprises a phenyl.

4. The low dielectric constant material of claim 2 wherein the aromatic moiety comprises an arylene ether.

5. The low dielectric constant material of claim 2 wherein the first backbone comprises a poly(arylene ether).

6. The low dielectric constant material of claim 2 wherein the first reactive groups comprises an electrophile.

7. The low dielectric constant material of claim 2 wherein the first reactive groups comprises an tetracyclone.

8. The low dielectric constant material of claim 2 wherein the second reactive groups comprises a nucleophile.

9. The low dielectric constant material of claim 2 wherein the second reactive groups comprises a tolanyl group.

10. The low dielectric constant material of claim 2 wherein the first and second reactive groups are identical.

11. The low dielectric constant material of claim 2 wherein the reaction is a cycloaddition.

12. The low dielectric constant material of claim 11 wherein the cycloaddition is a Diels-Alder reaction.

13. The low dielectric constant material of claim 2 wherein the cage structure comprises at least one carbon atom.

14. The low dielectric constant material of claim 2 wherein the cage structure comprises at least one of an adamantane and a diamantane.

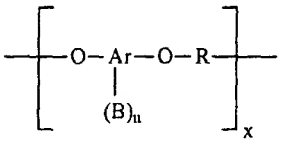
15. The low dielectric constant material of claim 2, wherein the cage structure is substituted with a substituent.

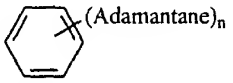
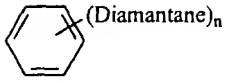
16. The low dielectric constant material of claim 2, wherein the substituent is selected from the group consisting of a halogen, an alkyl, and an aryl.

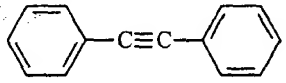
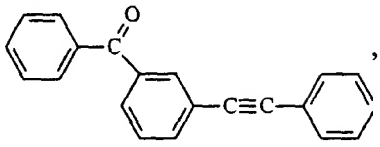
17. The low dielectric constant material of claim 2 wherein the cage structure is covalently bound to the first and the second backbone.

18. The low dielectric constant material of claim 2 wherein the cage structure is covalently bound to at least one of the termini of the first and the second backbone.

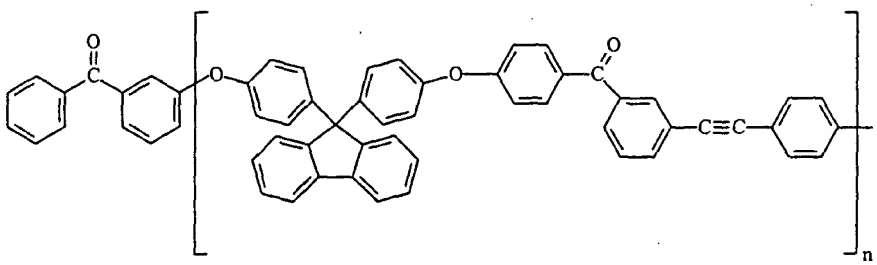
19. A low dielectric constant polymer having the structure:



wherein B is  or  with n =1-3, and wherein x = 1-10^3,

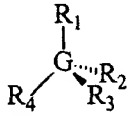
wherein R is  or  , and Ar is  .

20. A low dielectric constant polymer having the structure:



wherein n=1-10^3.

21. A thermosetting monomer having the structure:



wherein G is a cage structure, and wherein at least two of R_1-R_4 comprise an aromatic portion and a reactive group, respectively; and

wherein at least one of the reactive groups of a first monomer reacts with at least one of the reactive group of a second monomer to produce a low dielectric constant polymer.

22. A low dielectric constant material, comprising:

a first backbone having a first aromatic moiety comprising a phenyl and a first reactive group;

a second backbone having a second aromatic moiety comprising a phenyl and a second reactive group, wherein the first and second backbones are crosslinked without an exogenous crosslinker via the first and second reactive groups in a crosslinking reaction; and

a cage structure covalently bound to at least one of the first and second backbones, wherein the cage structure comprises at least 10 atoms, and wherein at least one of the first and second reactive groups is ethynyl.

23. The low dielectric constant material of claim 22 wherein the cage structure comprises at least one of an adamantane and a diamantane.

24. A layer comprising said low dielectric constant polymer of claim 21.

25. The layer of claim 24 wherein said aromatic portion comprises phenyl.

26. The layer of claim 25 wherein said cage structure comprises substituted or unsubstituted adamantane or substituted or unsubstituted diamantane.

27. A film comprising said low dielectric constant polymer of claim 21.

28. The film of claim 27 wherein the thickness of the film is less than 100μm.

29. The film of claim 28 wherein the dielectric constant is less than 3.

30. The film of claim 29 wherein said aromatic portion comprises phenyl.

31. The film of claim 30 wherein said cage structure comprises substituted or unsubstituted adamantane or substituted or unsubstituted diamantane.

32. An insulator comprising said low dielectric constant polymer of claim 21.

33. The insulator of claim 32 wherein said aromatic portion comprises phenyl.

34. The insulator of claim 33 wherein said cage structure comprises substituted or unsubstituted adamantane or substituted or unsubstituted diamantane.

35. An integrated circuit comprising the layer of claim 26.

36. An integrated circuit comprising the film of claim 31.

37. An integrated circuit comprising the insulator of claim 34.